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SHRUB NESTING OF THE RED-EYED VIREO IN RELATION TO STRUCTURE OF ASPEN FORESTS

William J. Mattson, Jr., *Principal Insect Ecologist*

ABSTRACT.— Nests were built in five species of high shrubs in four trembling aspen forests of northern Minnesota. Nest densities ranged between 0.5 and 3.0 per acre and were positively related to the abundance of large (>1.2-cm diameter) shrub stems.

OXFORD: 156.1:228.0:148.2 (*Vireo olivaceous*).
KEY WORDS: Breeding, nest density, forest structure, nesting habits.

Red-eyed vireos, *Vireo olivaceous* L., (REV) are among the commonest passerine species in the deciduous and mixed deciduous-coniferous forests of northern Minnesota. This note describes their nesting characteristics and nest densities in the shrub layer of four trembling aspen (*Populus tremuloides*) forests in relation to aspects of forest structure.

METHODS

I selected four study areas, each 25 acres, located in nearly pure stands of trembling aspen (35- to 45-year old) in extreme northern Minnesota, Koochiching County. Each study area was arbitrarily divided into four equal quadrats which were gridded into 64 blocks that were 1/10 acre large. I randomly selected five 1/10-acre plots from each quadrat (20/area) for counting nests which occurred from ground level to the bottom of the tree canopy (ca. 8 m). For each nest I recorded its height above ground, the species and stem diameter (5 cm above ground) of the shrub in which it was built, the basal area (basal area = cross-sectional area of tree trunks at 137 cm above ground) of overstory trees using a 10-factor prism, and whether the nest was active (with eggs or nestlings) or inactive.

Similar measurements were made on all other nests encountered between 1/10-acre sample plots within each study area but such nests were not used to estimate densities. The study was done between June 15 and 27, 1973, the period when birds were incubating eggs.

RESULTS AND DISCUSSION

Nesting Densities

Nests of the REV occurred in all four study areas (table 1). The number of active nests ranged from 0.0 to 1.0/acre, and the number of inactive nests ranged from 0.5 to 2.5/acre. Inactive nests were in various stages of deterioration because some were built the previous summer. These estimates are in accordance with observations by Southern (1958) and Rice (1978) which show that territory size of males ranges from 0.8 to 1.7 acres, thereby suggesting that nest densities should

range between 0.6 and 1.2/acre if a habitat is fully packed and each male has acquired a mate.

Nest Locations in Relation to Shrub Species and Height

Nests of the REV occurred in five shrub species: hazel (*Corylus cornuta*), juneberry (*Amelanchier* spp), chokecherry (*Prunus virginiana*), tag alder (*Alnus rugosa*), and mountain maple (*Acer spicatum*) (table 2). These were basically the same species in which Lawrence (1953) found REV nests. In this study, nest heights ranged from 0.75 to 3.00 m, and averaged 1.55 m over all areas. In other studies where the tree canopy was also included along with shrubs, nest heights were predictably higher: Williamson (1971) (range: 0.6 to 21.4 m, average: 3.2), Southern (1958) (range: 0.4 to 7.9 m, average 2.3), and Lawrence (1953) (range: 1.0 to 16.7 m, average 2.9). In Lawrence's study, 73 percent of the nests occurred at heights less than 4.57 m. All studies reveal, though, that the REV preferentially nests low because in spite of wide ranges in nest heights the mean heights were invariably around 2 to 3 meters.

Table 1.— Nest densities of the red-eyed vireo (based on 20 1/10-acre sample plots per area) and aspects of community structure in four different aspen forests in northern Minnesota

Study area	Shrubs/acre		Tree basal area/acre	Nests per acre		
	Total stems	Tall shrub stems only[1]		Active	Inactive	Total
	Number		Ft^2	Number		
1	7,149	1,146	125	1.0	0.5	1.5
2	16,322	5,126	110	1.0	2.0	3.0
3	8,296	1,754	108	0.0	0.5	0.5
4	15,783	2,360	115	0.0	2.5	2.5

[1]Tall shrubs are defined as those having basal diameters >1.20 cm, the smallest stem used by red-eyed vireos for nesting.

Table 2.— Environmental variables (means +standard errors of shrub stem diameter, nest height, tree basal area) associated with red-eyed vireo nests in different shrubs in different study areas[1]

Shrub species	Area 1— REV			Area 2— REV			Area 4— REV		
	Shrub stem diameter	Nest height	Tree basal area	Shrub stem diameter	Nest height	Tree basal area	Shrub stem diameter	Nest height	Tree basal area
	cm		Ft^2/a	cm		Ft^2/a	cm		Ft^2/a
Acer spicatum	—	—	—	—	—	—	3.7±0.3	202±20	135±05±
Alnus rugosa	2.9±0.2	172±14	143±13	3.1±0.3	154±36	125±05	—	—	—
Amalanchier spp.	—	—	—	3.7±0.0	[2]300±00	120±00	—	—	—
Corylus cornuta	1.5±0.1	114±09	143±22	1.5±0.1	135±07	103±10	1.7±0.1	133±17	138±17
Prunus virginiana	2.9±0.3	177±17	157±03	2.9±0.0	175±00	100±00	—	—	—

[1]N or total number of nests observed per area is 13, 21, and 7 for areas 1, 2, and 4, respectively.
[2]Standard error of 0.0 means that n=1.

Nest Locations in Relation to Overstory

Tree cover around REV nests was usually very dense. For example, mean basal area in the immediate vicinity of individual REV nests averaged 125 feet^2 , although it ranged from 20 to 190 feet^2 /acre. In general, REV nests were located under tree cover that was equal to or denser than the average for the particular study areas. For example, mean basal areas around nests compared with the respective study area means were as follows: 146 vs 125 for area 1; 107 vs 110 for area 2; 140 vs 108 for area 3; and 137 vs 105 for area 4. According to Williamson (1971), the REV characteristically feeds where the canopy is abundant and the understory is moderate to dense. In such environments it has a cylindrical territory extending from the lower understory into the tree canopy.

Nesting Locations in Relation to Shrub Abundance

REV's apparently select shrubs based on their relative abundances providing all other things are equal. For example, the following tabulation compares the frequency distributions of nests among tall shrubs with frequencies of tall shrubs (>1.2-cm diameter, the smallest stems used by REVs) at area 1 (n = 13 nests) and area 2 (n = 21) where enough nests were found for such a comparison:

AREA 1

Nests:	Alder 54%	Cherry 23%	Hazel 23%	Black ash 0%
Shrubs	Alder 50%	Cherry 0%	Hazel 13%	Black ash 37%

AREA 2

Nests:	Hazel 80%	Alder 10%	Cherry 5%	Juneberry 5%	Misc. Species 0%
Shrubs:	Hazel 62%	Alder 20%	Cherry 3%	Juneberry 3%	Misc. Species 12%

Frequency distributions of shrubs were determined by counting and measuring all shrubs which occurred on 20 3 m^2 plots randomly placed within each stand. In spite of differences between frequencies of nests and shrubs, the data still suggest that REV's may distribute their nests in relation to the relative abundances of certain tall shrubs having the proper physical and other attributes. For some reason, REVs apparently avoided black ash at area 1 even though it was abundant and selected chokecherry in spite of its relative scarcity.

Moreover, the density of total nests per acre seems to increase with the density of large shrubs:

large stems/acre	5126	2360	1754	1146
total nests/acre	3.0	2.5	0.5	1.5

However, area 3 (1754 stems/acre) was anomalous, having the lowest nest density but not the lowest large shrub density. Since the REV nests across a wide spectrum of heights, it's possible that most REV nested in the canopy rather than in the shrub layer at area 3, thereby accounting for the paucity of nests. This explanation is probable because the tree canopy at area 3 was only 8 to 10 m above the ground, about 3 to 4 m lower than at other areas. In other words, the amount of airspace between the shrub and tree canopies could affect the vertical positioning of nests and the degree of nesting in the shrub layer.

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